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THESIS

EVALUATION OF USER INFORMATION SATISFACTION OF THE COMPOSITE HEALTH CARE SYSTEM

by

Lyn Eric Hurd

March, 1991

Thesis Advisor: Moshe Zviran

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EVALUATION OF USER INFORMATION SATISFACTION OF THE COMPOSITE HEALTH CARE SYSTEM

by

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of the requirements for the degree of

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ABSTRACT

This thesis describes the level of User Information Satisfaction with the Composite Health Care System (CHCS). A short-form User Information Satisfaction questionnaire, developed by Baroudi and Orlikowski (1988), was administered to CHCS users at the Naval Hospital, Charleston.

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I. INTRODUCTION

A. OVERVIEW

Organizations of all types are seeking to improve their effectiveness and efficiency by using information systems. Considerable amounts of time and money are spent to develop and implement information systems within an organization. Once inplemented, an information system may or may not be effective in accomplishing its objective. Thus, an important and necessary stage in justifying any particular information system is to determine its value of effectiveness to the organization.

The Department of Defense (DoD) has undertaken the development and implementation of a large information system for use at Medical Treatment Facilities. The system is called the Composite Health Care System (CHCS). Due to the costs associated with this system, a simple and efficient measure is needed to analyze the effectiveness of this information system.

Selecting the appropriate measure of system effectiveness is difficult. Much emphasis is placed in many organizations on economic analysis of information system. This type of analysis provides only an economic measure of effectiveness for a system: will the benefit outweigh the cost? If the

objective of the organization is not purely economic, the measure is not complete.

Many researchers have proposed measuring the level of satisfaction perceived by the users of the system as a surrogate measure of effectiveness. No matter how technically correct an information system, if the users are not satisfied with the system, it is not an effective system. Conversely, if the users are satisfied, the system is considered effective in meeting their needs.

B. RESEARCH OBJECTIVES

This study will investigate through empirical research whether the Composite Health Care System is effective through the use of the user information satisfaction surrogate measure. Using a previously developed, documented, and validated survey instrument, this study will describe the user information satisfaction characteristics at one implementation site of the Composite Health Care System: Naval Hospital, Charleston. The results of this survey will help pinpoint potential problem areas with the system implementation as well as document areas without problems. Once completed, the results will serve as a baseline gauge to compare satisfaction with CHCS at other facilities and to measure changes in satisfaction at Charleston at a later time.

II. DESCRIPTION OF THE COMPOSITE HEALTH CARE SYSTEM

A. BACKGROUND

The Department of Defense (DoD) has pursued the goal of providing automated computer support to its hospitals and clinics since 1968. In February 1979, the Mission Elements Need Statement (MENS), establishing the need for an automated computer system was approved. Under the direction of the Tri-Service Medical Information System (TRIMIS) program office, stand-alone and integrated health care computer systems were acquired, implemented and operated to support Pharmacy (TRIPHARM), Laboratory (TRILAB), Radiology (TRIRAD), Appointment and Scheduling (TRIPASS), Quality Assurance (AQCESS), and Hospital Information System (HIS). The knowledge and experience gained through the operation of these systems since 1979 was used to refine and validate the system requirements for a completely new and fully integrated information system: The Composite Health Care System (CHCS).

B. CHCS PURPOSE

The primary purpose of CHCS is "to provide health care services that support military forces in fulfilling their required mission...." (Draft System Decision Paper, 1989). Improving the efficiency and effectiveness of military health care delivery during peacetime and during mobilization through

integration of information resources is the goal of CHCS. The major focus of CHCS is the integration of shared information resources to resolve the deficiencies of communication, decision support, and information processing. The Composite Health Care System is designed as a fully integrated medical information system that provides automated support of information requirements for military medical treatment facilities. CHCS supports the administrative functions and the delivery of health care with information retrieval services.

C. DEPLOYMENT STATUS

CHCS is undergoing the Operational Test and Evaluation (OT&E) phase and is currently deployed to Naval Hospital Charleston as one beta-test site. The role of a beta-test site is to incrementally replace the TRIMIS systems with validated CHCS software. Continued validation of requirements and extensive evaluation of the CHCS software is conducted prior to the decision to deploy CHCS worldwide.

D. OPERATIONAL FEATURES

CHCS supports various functional areas in sharing information. Each functional area uses this information for its own purpose and communicates results/activities to other areas. Functional areas supported by CHCS include:

1. Patient Administration

Patient administration does the registration of a patient into the system. Once in the computer system, the patient's demographic information is available for access by all other modules. The patient administration module also performs the functions to admit patients to the hospital, transfer patients between wards, and discharge patients from the hospital. The creation, update and closing of inpatient records is also performed by the patient administration module.

2. Patient Appointment and Scheduling

The Patient Appointment and Scheduling module provides for a centralized appointment service, a decentralized appointment service, or a combination of both depending on the desire of the hospital. The appointment service creates and maintains the appointment schedule for the hospital. A patient is given an appointment date and time to see the health care provider creating a centralized repository of information to produce operational reports of activity.

3. Nursing

CHCS supports inpatient nursing in a variety of areas. In the area of patient care, nursing uses the system for entering and obtaining the status of all physician orders, entering patient assessment data, and generating patient care plans. Documentation of patient progress is performed in the

automated nursing notes. Nursing unit management uses CHCS to generate shift care plans, patient management reports, drug administration time reports, and staffing requirement reports. Routine administrative functions are performed by CHCS for nursing including: staff credentialling, documentation of continuing education and in-service training, and staff scheduling capabilities.

4. Laboratory

The laboratory uses the CHCS system for processing of orders for laboratory tests with automated reporting of test results. Specimens are processed, tracked, and reported through the system. All results are placed into the patients automated medical record and are immediately available for inquiry by health care providers. Automated control of blood bank operations including: blood acquisition, inventory and utilization are accomplished through CHCS. The laboratory is supported with ability to manage inventory control, register patients into the tumor registry, conduct a drug testing program, and generate a multitude of management reports.

5. Pharmacy

The pharmacy uses CHCS to process prescriptions for patients that are ordered by health care providers. The health care provider enters the prescription information at a terminal located in his office. The information is electronically transmitted to the pharmacy. The pharmacy can

immediately prepare the medication for dispensing before the patient leaves the physician's office. CHCS automatically performs checks for patient allergies, drug interactions with medications the patient is currently taking, drug dosage for the age of the patient, and records the prescription into the patient's medical record. In-patient order processing is accomplished in much the same fashion. On-line drug monographs are available for inquiry by medical staff at any terminal. Pharmacy management of inventory control and reporting are also accomplished.

6. Radiology

Orders for radiological procedures are electronically transmitted to the radiology department where the order is processed. Order tracking and results reporting are performed by the system. Radiology results are immediately available for inquiry by medical staff. Department management including inventory control is also conducted through CHCS.

7. Clinical Dietetics

The Clinical Dietetics service uses CHCS to obtain patient data needed to access the nutritional needs of the patient. This information is used to create patient diet plans, select patients of interest, patient menu selections and monitor patient nutritional data. CHCS is also used to maintain the nutrition clinic schedule and compute clinical dietetics workload data.

E. POTENTIAL BENEFITS

In general terms, the overall benefits of the CHCS system include:

1. reliable, timely, easily accessible clinical information
2. improved documentation for medicolegal issues
3. improved communication
4. improved patient satisfaction
5. improved management efficiency

III. USER INFORMATION SATISFACTION AND ITS MEASUREMENT

A. INTRODUCTION

Organizations spend considerable amounts of time and money to develop and implement information systems. However, since financial resources are scarce and limited, not all application systems can be developed. Only those applications that can be justified are approved and developed. An important and necessary stage in justifying any particular information system is to determine its value or effectiveness to the organization.

B. METHODS TO ASSESS EFFECTIVENESS

Several methods have been suggested in the empirical and non-empirical literature for assessing the effectiveness of an information system.

System usage (Swanson, 1974; Conrath and Mignen, 1990) assumes that a casual relationship exists between effectiveness of an information system and the amount of time the system is used. An effective information system is used more than a less effective system. This method also assumes that the use of the system is optional to the user. If, however, the use of the system is mandatory, the relationship between use and effectiveness fails.

Others (eg., Hamilton and Chervany, 1981) argue that effectiveness is determined by comparing performance to ojbectives. To assess the effectiveness of an information system, the task objective of the system is first determined. Criterion measures are developed to measure the extent to which the information system accomplishes the determined objectives. Problems are encountered with this method because: objectives and measures are often not defined adequately; efficiency-oriented and easily employed measures are frequently used over effectiveness-oriented and difficult measures; individual interpretations of what the ojectives and measures are, often conflicting, exist.

Another method frequently used to determine the value of an information system is by economic (cost-benefit) evaluation. The benefits of a system, by improved organizational effectiveness, are weighed against the cost for development and operation of the system (Nolan, 1974). Although this appears objective and comprehensive on paper, in practice, cost-benefit analysis is highly subjective and difficult to conduct (Nolan, 1974). The difficulties in using this approach for research argued by Ives et al. (1983) stem from the fact that: (1) many costs and benefits are intangible and not easily recognizable and/or converted into monetary equivalents, (2) unstructured, ad hoc decision making benefits are nearly impossible to objectively assess, (3) even when these items are determined by an organization, the data are

generally unrecorded and not available for research (Ives et al., 1983).

Theoretically, evaluation of the effectiveness of an information system is best accomplished by decision analysis, based on its degree of use in decision making and the resultant productivity benefits attributable to its use (Nolan, 1974). An effective information system supports a user by retrieving necessary information in the proper format, level of detail, and at the proper frequency for use. However, the decision analysis approach suffers a significant drawback for use in scientific research: it is non-quantifiable and cannot be easily replicated.

C. THE USER INFORMATION SATISFACTION CONSTRUCT

A surrogate for utility in decision making is the satisfaction of users of the information system (Neumann and Segev, 1980; Ives et al., 1983; Bailey and Peason, 1983; Baroudi and Orlikowski, 1988).

Webster's New Collegiate Dictionary defines satisfaction as "the fulfillment of a need or want". Organizational Psychologist Bernard Bass (1965) generically defines satisfaction to mean "... the extent to which the item is rewarding to us relative to how much better we might do elsewhere and what aspirations we have."

The concept of User Information Satisfaction (UIS) can be traced back to the work of Cyert and March (1963). Their

research argues that organizational behavior continually imposes upon the manager the need for information. If a formal information system exits, the success or failure of that information system to meet the needs of the user either reinforces or frustrates the user's sense of satisfaction with that system.

Figure 3.1, an adaptation of the Cyert and March model, portrays the reinforcement/reduction of satisfaction process in decision making using the information system. When a user perceives that the needed information should be readily available in the formal information system, he will use the information system in the normal manner to retrieve the required information. If the information is readily available, satisfaction with the system will be reinforced. But, if the information is not readily available, he must adapt and conduct a search beyond the information system by ad hoc methods or by some other less familiar method.

An "expanded search" through the information system is a cause of frustration to the user because of the time and effort used to obtain the necessary information. Additionally, the user is frustrated because he perceived the information to be readily available when it was not. From users' standpoint, information systems may actually block the user from carrying out the act of decision making (Nolan, 1965).

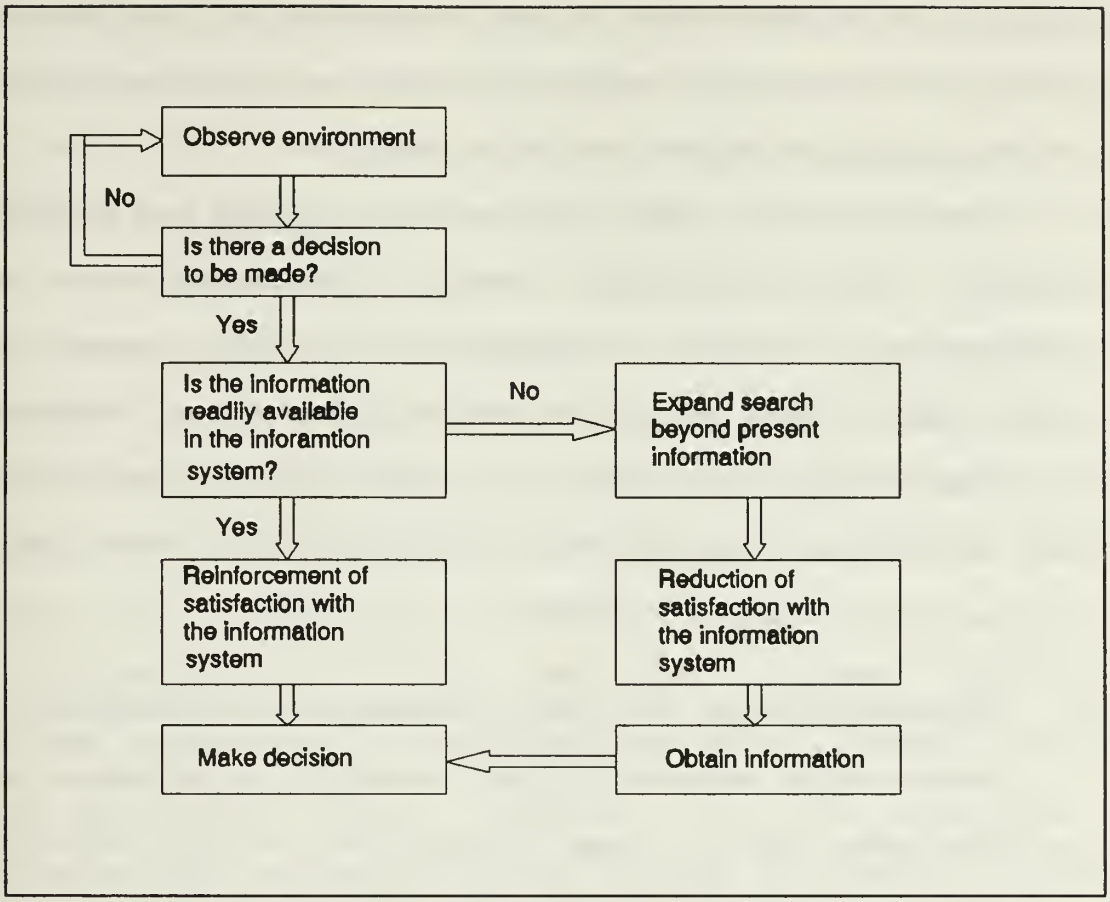

Figure 3.1
UIS reinforcement/reduction
in decision making

The information system is continually being evaluated by the user from repetitive use. If over a period of time of use, the user perceives that the information system cannot retrieve the information without the frequent use of expanded searches, frustration will occur. Consequently, this may lead to an expression of user dissatisfaction with the information system. The project is a failure if the end product does not satisfy the manager whom it is to serve (Powers and Dickson, 1973). If, however, the user is able to reliably obtain the

needed information with normal operation of the information system, satisfaction with the system will be reinforced and the information system is successful.

Of note are two empirical studies, (Aldag and Power, 1986; Gallupe and Desanctis, 1988), undertaken to find a relationship between satisfaction and actual system performance using objective third party judges. The results of these studies, however, are conflicting but do not support the assumption that increased satisfaction indicates actual system performance increases.

D. THE MEASUREMENT OF USER INFORMATION SATISFACTION

Potentially measurable and generally acceptable, several studies have employed user information satisfaction (UIS) as a dependent variable to indicate system effectiveness and acceptance (Ives and Olson, 1979; Igbaria and Nachman, 1990). Neumann and Segev (1980) show a correlation between user's reaction to satisfaction factors and their perception of the organizations's performance. Swanson (1974) empirically found high correlation between the user's appreciation of the system and his/her usage of the outputs. Powers and Dickson (1973) concluded that user satisfaction is the most critical factor for system success. Although there is no standard measure of satisfaction in these studies, it is argued that user information satisfaction is an indicator of system usage and success.

The level of user information satisfaction in the studies is derived from a myriad of factors when users were asked to evaluate their computer services relative to a sense of satisfaction (Bailey and Pearson, 1983). Factors measured in the various studies include: accuracy, content, frequency, timeliness, reliability, assistance, adequacy, accommodation, communication, access, appreciation and flexibility. Each of these studies use a measure that is unique to that particular study (Ives et al., 1983), but taken as a whole provide insight into a description of UIS.

Validation of the UIS measures in these studies is limited, especially in handling threats to internal validity (Haga and Zviran, 1990). However, a tool for measuring and analyzing UIS was developed by Bailey and Pearson (1983), based on the previous studies, that provides the basis of an instrument, later refined (Ives et al., 1983), and validated (Baroudi and Orlikowski, 1988) for use. Although the method employed to measure user satisfaction by this tool is a pre-experimental design lacking pretest-postest or control group (Campbell and Stanley, 1966), Conrath and Mignen (1990) claim it represents a key contribution in the development of a standard instrument to measure user satisfaction. The development and refinement of this instrument will be described in more detail.

Bailey and Pearson (1983) described a model proposed by Lawler and Wanous (1972) for measuring user satisfaction:

$$S_i = \sum_{j=1}^{i} R_{ij} W_{ij}$$

where

R_{ij} = The reaction to factor j by the individual i
W_{ij} = The importance of factor j to individual i

Using this model, the satisfaction of the user is measured as the weighted sum of the user's positive and negative reactions to a set of factors about the information system (Bailey and Peason, 1983). The user's perception of a "good" information system would be a system that the user is very satisfied with the factors considered most important in the system.

To implement the model, the set of factors representing the domain of user satisfaction was established via a review of 22 studies dealing with computer/user interface (Bailey and Pearson, 1983). The initial 36 factors generated from the literature review were expanded to 39 factors after further review by middle managers. They concluded that the 39 factors included represent the domain of user satisfaction at α=0.01.

Bailey and Pearson (1983) used four bipolar adjective pairs on a seven point Likert-type scale to measure the user's perception of a factor. Along with the four adjective pairs was included the user's perception of importance of the factor. The seven intervals from negative to positive were denoted by adverbial qualifiers. Figure 3.2 represents their

use of the semantic differential technique for measuring the user's response to "Format of Output" factor.

Format of Output: The material design of the layout and display of the output contents.

```
          good :___:___:___:___:___:___:___: bad
        simple :___:___:___:___:___:___:___: complex
      readable :___:___:___:___:___:___:___: unreadable
        useful :___:___:___:___:___:___:___: useless
To me, this factor is
     important :___:___:___:___:___:___:___: unimportant
```

Figure 3.2 Illustration of questionnaire form

The Bailey and Pearson user information satisfaction questionnaire was determined to be a reliable, valid instrument (Bailey and Pearson, 1983). It represented an important first step toward the development of a valid and useful UIS measure (Ives et al., 1983).

Deese (1979) used the Pearson questionnaire at the Federal Computer Performance Evaluation and Simulation Center. He stated, "The results identified problems that would not otherwise have been discovered" and claimed that the user satisfaction questionnaire was a very useful and worthwhile tool (Deese, 1979).

Ives, Olson and Baroudi (1983) chose to undertake an in-depth assessment of the Pearson (1983) questionnaire. Replicating the initial Bailey and Pearson study, they were able to reinforce the validity and reliability of the

instrument. They presented several approaches to improve the quality of the original Pearson instrument.

The goal of the suggested improvements was to establish a standardized "short form" instrument. Since Pearson found the importance scale provided no additional information, it was eliminated from the instrument. Scales which showed undesirable psychometric qualities were also eliminated. The number of items scaled within a question was reduced from four to two in order to reduce the time to complete the questionnaire. All of the scales in the original Pearson instrument were scored positively to the left and negatively to the right end of the scale. To reduce the undesired effects created by a person simply marking down a column of responses, some of the scales were reversed scored, thereby increasing the reliability of the measure. The resulting short form was determined to substantially measure the concept of UIS originally proposed in the Pearson full instrument (Ives et al., 1983).

The short form measure (Ives et al., 1983) was further subjected to testing by Baroudi and Orlikowski (1988) to examine its psychometric properties. The final short form questionnaire consisted of 13 questions with two items evaluated per question (Appendix A). Each item is scored on a seven point Likert-type scale from -3 (dissatisfied) to +3 (satisfied) with zero indicating a neutral response.

The total individual user information satisfaction score is calculated by averaging the responses of the two items for each question and summing the scores of the 13 questions.

$$S_i = \sum_{1}^{13} \frac{R_1 + R_2}{2}$$

where
S_i = total individual user satisfaction
R_1 = response to the first item scale
R_2 = response to the second item scale

The range of total satisfaction can be from -39 to +39.

Three factors; electronic data processing (EDP) staff and services (Factor A), information product (Factor B), and knowledge and involvement (Factor C); were found to comprise user satisfaction using factor analysis by Ives, Olson and Baroudi (1983). These subtotals are calculated as the average of the responses to questions loading into a particular factor. Questions 1, 2, 6, 11, and 12 load heavily into the electronic data processing (EDP) staff and services factor. Questions 7, 8, 9, 10 and 13 load heavily into the information product factor. Questions 2, 3, 4, and 5 load heavily into the knowledge and involvement factor. The factor subtotals will range from -3 to +3 in value. Averages are used for meaningful comparison between the three factor scores.

Data were gathered for the study from 358 employees, mostly clerical and support personnel, of 26 New York area

organizations. Construct validity was determined first by examining the relationship between each scale and the total UIS score. Factor analysis using varimax rotation converged to a three factor solution accounting for 68% of the variation in five iterations. This provides strong evidence of construct validity (Baroudi and Orlikowski, 1988).

Convergent validity was proven by comparing an interview measure of satisfaction with the instrument measure in two groups. One group of users were generally pleased and satisfied with the information system and the other group of users were generally dissatisfied on interview. Administration of the instrument indicated a statistically significant difference by t-test in the groups at $p < .001$ (Baroudi and Orlikowski, 1988).

The total satisfaction and subtotal scores reported a reliability level above the .80 required for research. This demonstrates the instrument is internally consistent and reasonably free from measurement error.

The work by Baroudi and Orlikowski (1988) and resulting short-form UIS instrument provides a reliable and valid measure of user information satisfaction. It furnishes a meaningful, standardized measure of the overall satisfaction with an information system as well as specific information about satisfaction within the subfactors of electronic data processing (EDP) staff and services, information product, and user knowledge and involvement.

IV. RESEARCH METHODOLOGY

A. INTRODUCTION

The purpose of this research is to identify the characteristics of user information satisfaction (UIS) for users of the Composite Health Care System (CHCS). The study is based on statistical analysis of empirical data collected for CHCS users at the Naval Hospital, Charleston, SC. The following sections will discuss the survey instrument, data collection methodology and methods of statistical analysis employed in the study.

B. THE SURVEY INSTRUMENT

To avoid the pitfalls associated with developing a comprehensive survey questionnaire, the previously developed, psychometrically evaluated and validated short-form questionnaire of Baroudi and Orlikowski (1988) was used without alteration. A copy of the complete survey questionnaire is included in Appendix A. The questionnaire is composed of two sections: a demographical section and a user information satisfaction section.

1. Demographic Section

The first section of the questionnaire requested general information. Questions 1-5, the respondents were asked to give their hospital department, job description,

highest level of education, age, and gender respectively. To determine the user's experience level with the system, the sixth question asked for the length of time, in months, the respondent had used CHCS. Further determination of the user's experience was sought in questions seven and eight. Question seven asked if the user had used other computer systems previously. If the respondent answered "yes" to question seven, he or she was asked if the previous system was a health care information system.

2. User Information Satisfaction Section

The second part of the survey directly addressed the issues of user information satisfaction. The instrument was designed to elicit the user's perception of how well the CHCS system functioned in their area. It consisted of thirteen questions; each question having two bipolar adjective Likert-type item scales for responses. Each item can take on one of seven values from -3 (extremely dissatisfied) to +3 (extremely satisfied) with zero indicating a neutral response.

The questions asked can be categorized into one of three factors of user satisfaction.

Management Information Services (MIS) Staff and Services: This factor is the respondent's perception of the attitude and responsiveness of the MIS staff and the relationship with the MIS staff. Due to the fact that the MIS personnel at the Naval Hospital, Charleston provide only local

support and act as liaison to the contractor that supplies the software product, this factor is further broken down to reflect services provided by the local MIS department and the contractor.

Information Product: This factor is the respondent's perception of the quality of output delivered by CHCS.

Knowledge and Involvement: This factor is the respondent's perception of the quality of training provided, their understanding of the system, and their participation in its development.

C. SAMPLE AND DATA COLLECTION

Naval Hospital, Charleston is one of thirteen beta-test sites for CHCS software. It was selected as the site to conduct the survey because all functional modules were to be operational at the time of the survey. Since the in-patient modules, servicing nursing and clinical dietetics, were not implemented at the time of data collection, the sample population then consisted of personnel from out-patient and administration areas.

A local point of contact acted as a distribution and collection agent for the surveys. The questionnaires, each accompanied with a cover letter (Appendix B), were mailed to the point of contact at the site. The point of contact distributed 180 questionnaires and return envelopes to all department personnel within the hospital operating the CHCS

modules. The surveys were completed and returned by the respondents to the point of contact in sealed envelopes and then the questionnaires were forwarded to the researcher for analysis.

110 questionnaires were returned, of which 101 surveys had complete information. This represents a final return rate of 56%.

D. STATISTICAL ANALYSIS METHODS

Data from completed surveys were coded and entered into a spreadsheet program. The spreadsheet program was used to perform the statistical analysis. The specific procedures used in the analysis will be presented next.

1. Respondent's Satisfaction Index

Each respondent's total satisfaction index was calculated for the 13 questions using the following formula:

$$S_i = \sum_{j=1}^{13} \frac{R_{aij} + R_{bij}}{2}$$

where:

S_i = Satisfaction Index for respondent i
R_{aij} = Response to first item scale of question j for repondent i
R_{bij} = Response to second item scale of question j for respondent i

2. Total Satisfaction Index

The overall or total satisfaction index for the survey group is calculated by averaging the respondent's satisfaction index to find the mean.

3. Question Averages

The mean response to each of the thirteen questions is calculated for comparison of individual questions.

4. Factor Subtotals

The thirteen questions can be grouped into three factor subtotals as was defined by Ives, Olson, and Baroudi (1983): MIS staff and services (Factor A); Information product (Factor B); and Knowledge and involvement (Factor C). The mean of the individual questions averages is calculated to find the factor subtotals. Questions 1, 2, 6, 11, and 12 are used for the MIS staff and services subtotal. Questions 7, 8, 9, 10, and 13 are used for the information product subtotal. Questions 2, 3, 4, and 5 are used for the knowledge and involvement subtotal.

The MIS staff and services sub-factor is further subdivided to provide insight into the distinction between the local Management Information Department (MID) department functions and the functions of the software contractor. Again, the mean of the individual question averages is calculated to subdivide the MIS staff and services factor. Questions 1, 6, and 11 directly address the attitude, services

and relationship with the local MID are used for the local MID factor. Questions 2 and 12 address issues associated with software developement, the responsibility of the civilian contractor, and are used for the contractor factor.

5. Comparison of Groups

The respondents were categorized by the type of use of the CHCS system. Three work groups were identified: (1) Physicians; (2) Ancillary; and (3) Administration. The individual question averages, total satisfaction indexes, and sub-factor totals were compared for one group verses the combination of the other two groups using a t-test with the significance level of alpha = 0.05. The t-test is used to determine if there is a significant difference between the arithmetic mean value of two groups.

V. DESCRIPTIVE FINDINGS

A. DEMOGRAPHIC FINDINGS

Of the 101 respondents, 57 were male and 44 were female. The age of the respondents ranged from 19 to 56 with a mean of 32 years old.

1. Work Center Distribution

The hospital department work centers reported were out-patient areas including: administration, clinics, pharmacy and laboratory departments. The CHCS modules for in-patient areas were not operational at the time of the survey. Personnel from in-patient areas were not included in the study. Figure 5.1 reflects the distribution by work center.

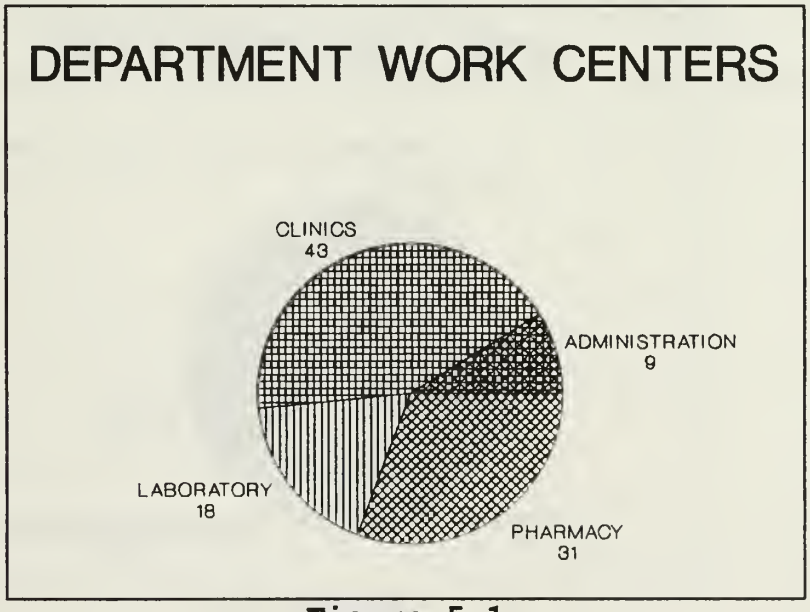

Figure 5.1

2. Job Description Distribution

The job descriptions reported are from a multitude of specific functions but can be categorized as:

1. Technician - a hospital corpsman functioning in a medical-technical capacity (pharmacy technician, laboratory technician, clinic corpsman)
2. Physician - a medical doctor
3. Health Professional - a licensed medical professional other than a physician (nurse, pharmacist, physical therapist, bio-medical officer)
4. Other - a person not listed above (hospital administration non-medical clinic staff)

Figure 5.2 reflects the distribution by job description.

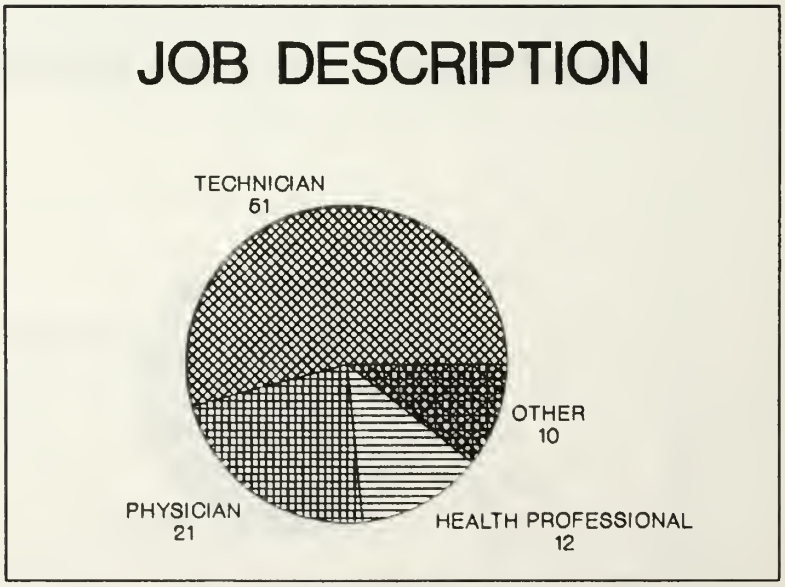

Figure 5.2

3. Work Group Distribution

For the purposes of this investigation, the study population was segregated according to the assumed primary use of the computer system. The categories provide a clear separation of work groups from an organizational and cultural standpoint. These groups are used extensively throughout the study.

1. Administrative - use of the system for indirect medical purposes (patient registration, appointment scheduling and administrative reporting)
2. Ancillary - use of the system for direct medical support (prescription filling, laboratory specimen processing)
3. Physician - use of the system by physicians (accessing patient data, transmission of orders)

Figure 5.3 represents the population of respondents according to their main use of the system.

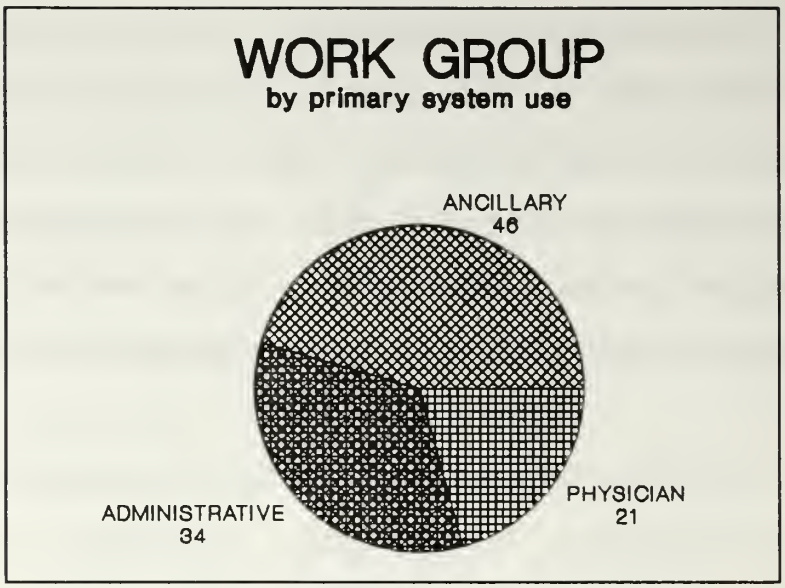

Figure 5.3

4. Education Distribution

The level of education reported by the respondents represents a well educated user population. Almost half of the users have a college degree and almost ninety percent have had some college education. Figure 5.4 represents the breakdown by education.

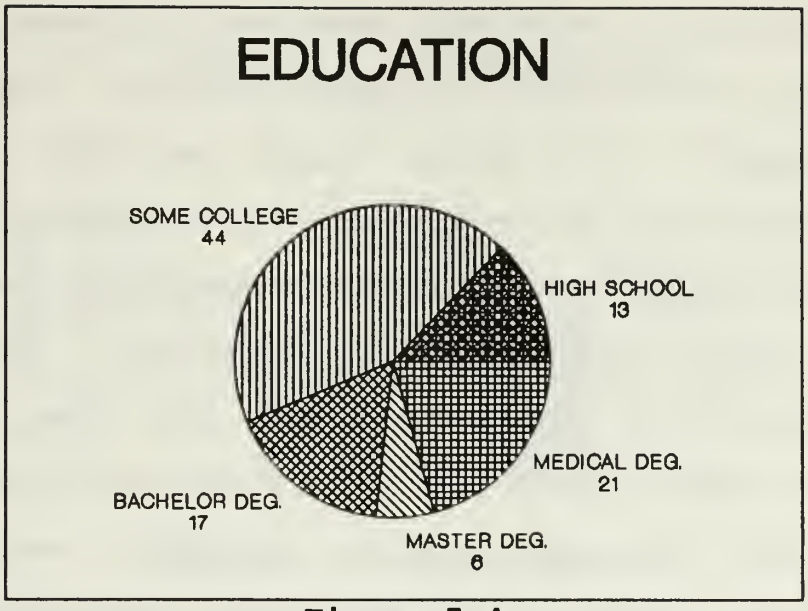

Figure 5.4

B. COMPUTER SYSTEM USE

The length of time the respondents reported as having used the CHCS computer system ranged from one month to 18 months with a mean of 8.7 months. Of the 101 respondents, 83 had used a computer system previously. Only 24 of the 83 users had used a health care information system before the CHCS implementation. Although many of the respondents had experience with computers, this was the first exposure to a health care information system for 76 percent of the users.

C. SATISFACTION FINDINGS

The survey results for user satisfaction are compared for the three work groups in three areas: 1) overall satisfaction,

2) responses to individual questions, 3) three group factors: MIS staff and services, information product, and knowledge and involvement. The actual values reported in the survey responses are not significant in themselves, rather the relative scores among individual questions, sub-factors and work groups are useful for comparison. Since ancillary composes 46% of the survey group, the survey averages will tend to more closely reflect the responses of the ancillary group than the other groups. Therefore, average scores on individual questions are not fully representative and are included only for rough comparisons.

1. Overall Satisfaction

Overall satisfaction is measured by the mean of the sum of the responses to the survey questions. The mean survey score index was 11.26 on a scale ranging from -39 to +39. Figure 5.5 presents a comparison of the overall satisfaction index the three groups and the overall mean satisfaction. The survey shows that the administrative group displays the highest overall satisfaction (14.96), followed by ancillary (9.65), with physicians recording the least overall satisfaction (8.07). Using a t-test, there is no significant difference between any one work group and the remaining groups at alpha = 0.05.

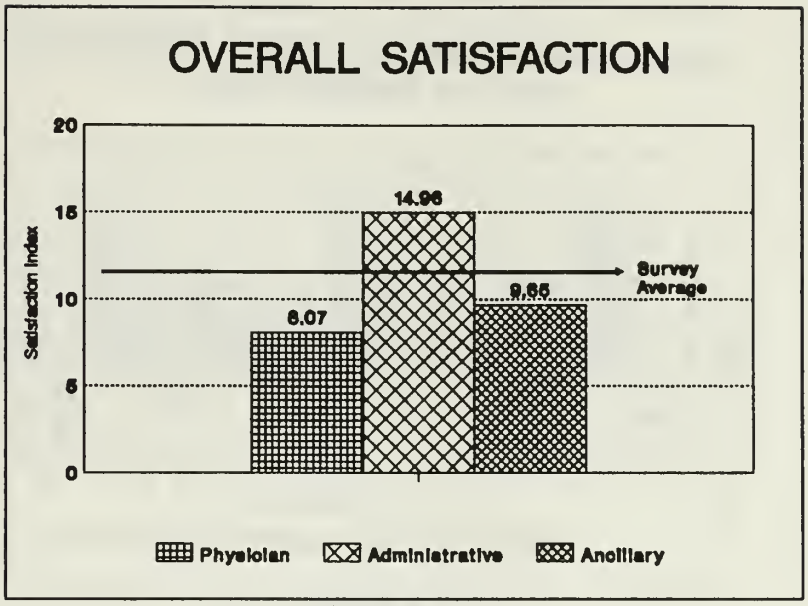

Figure 5.5

2. Individual Questions

Each of the 13 questions on the survey has two responses from the user. The response scales were reversed scored on many of the questions to neutralize the effect of an individual marking boxes straight down the questionnaire. Figure 5.6 shows the average level of satisfaction for individual questions by work group.

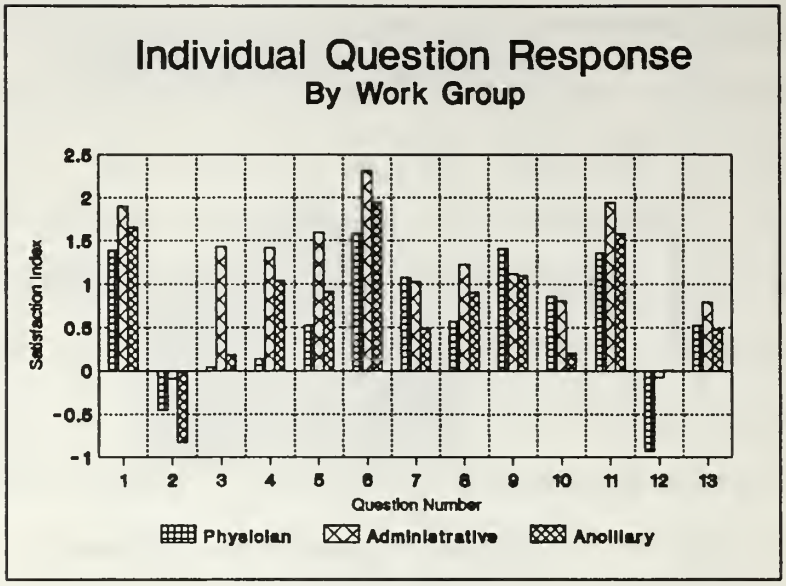

Figure 5.6

It is readily apparent that some questions exhibit a relatively high or low level of satisfaction when compared to the other questions. Three questions (question 1, 6 and 11) stand out from the others for the high level of satisfaction expressed by the users. Each of these questions deal with issues concerning the Management Information Services (MIS) staff. Two questions stand out as exhibiting an extremely low (negative) satisfaction index. Questions 2 and 12 are concerned with software development time. A complete decomposition of each question by work group will follow.

Figure 5.7 displays the responses to individual questions by physicians compared to the remainder of the respondents; Figure 5.8 administrative compared to the remainder; Figure 5.9 ancillary compared to the remainder.

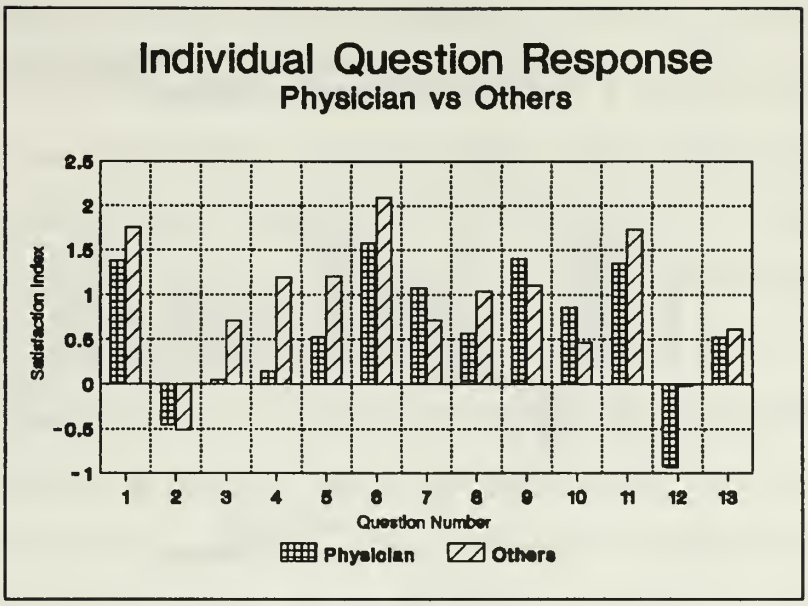

Figure 5.7

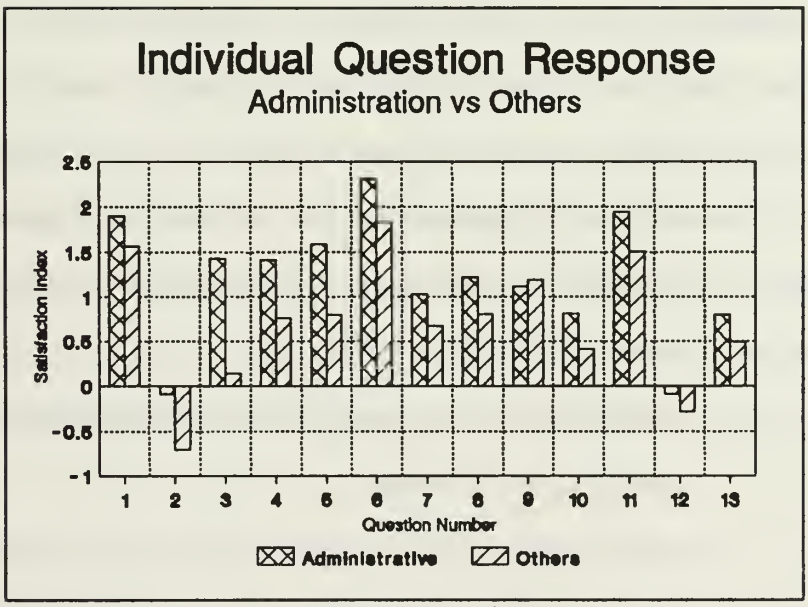

Figure 5.8

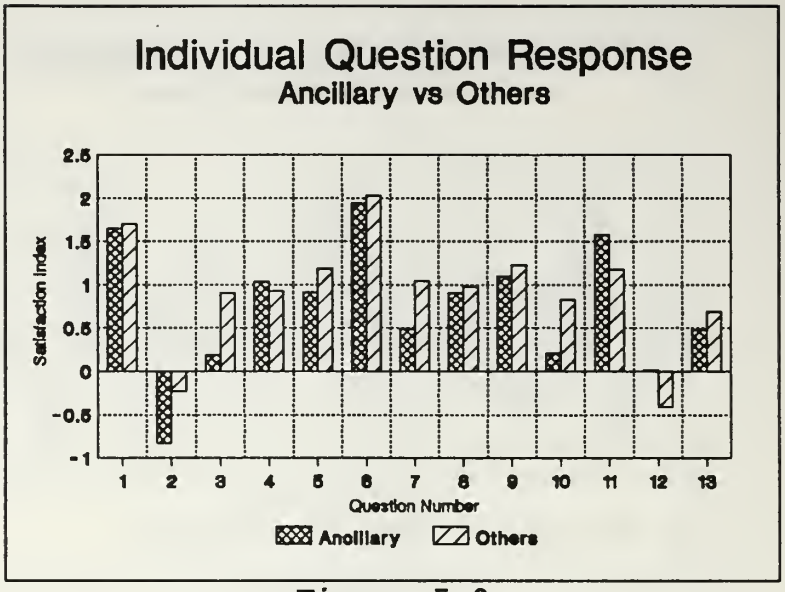

Figure 5.9

a. Question 1 - Relationship with the Management Information Department (MID) Staff

This question measures the level of constructive interaction between the user and the Management Information Department. As noted earlier, the level of satisfaction towards the MID staff is relatively high. Although not statistically significant at alpha = 0.05, the administrative group showed the highest level of satisfaction of the three groups. Slightly lower was the ancillary group followed by the physicians.

b. Question 2 - Processing of Requests for Changes to Existing Systems

The requested responses were concerned with the length of time required and timeliness of changes to the CHCS

system. The overwhelmingly negative level of satisfaction; the lowest scoring question; indicates a perceived problem by the users. Ancillary users were the least satisfied, physicians slightly higher and administrative users, albeit still negative, the highest group. A t-test indicated no significant differences at alpha = 0.05.

c. Question 3 - Degree of Training Provided to Users

This question asked if the users were completely trained to use the system. The level of satisfaction of the administrative group was statistically higher at alpha = 0.05 than the other groups combined. Correspondingly, the ancillary group was significantly less satisfied with the training. The physicians had the lowest mean score but did not prove to be statistically different.

d. Question 4 - User's Understanding of the System

The level at which a users understands a system naturally flows from training and experience. As expected, the response to this question closely parallels the users perception of the degree of training provided. In this case, physicians were significantly less satisfied at alpha = 0.05. Of particular note is the significant improvement in satisfaction in the ancillary group from their satisfaction of training.

e. Question 5 - User's Feeling of Participation

The user's perception of participation is beneficial for the success of a computer system. Lack of participation may lead to dissatisfaction with the system. In response to this question, the administrative group had a statistically significant higher feeling of participation than the other groups. Physicians perceived the least amount of participation. Ancillary personnel responded more positively than physicians but less positively than administrative.

f. Question 6 - Attitude of the Management Information Department (MID) Staff

The willingness and commitment of MID staff to lend assistance for the benefit of the users is measured by their perceived attitude towards the users. The overall response to this question (the highest rated question) indicates that MID displays a highly cooperative and positive attitude. All three groups responded favorably. However, administration reported a statistically significant (alpha = 0.05) higher response than the other groups. Although the physicians scored this question the highest of all 13 questions, their response was statistically lower than the other groups.

g. Question 7 - Reliability of Output Information

Users must be able to accept the output information provided by the computer system as reliable. This is extremely important for medical information systems. The

responses were positive with no significant differences among the groups. Of note is the fact that physicians responded more favorably than the other groups and ancillary the least favorably.

h. Question 8 - Relevancy of Output Information (to intended function)

This question measures the degree of congruence between what the user wants or requires and what is provided by the information products and services. All groups responded positively without statistically significant differences. The administrative group was most satisfied with the relevancy of output of the three groups.

i. Question 9 - Accuracy of Output Information

All three groups were satisfied that the system was providing correct information. Of the three groups, the physicians were the most satisfied with the accuracy of output information. Ancillary and administrative groups were about equally satisfied. The differences in responses were not statistically significant.

j. Question 10 - Precision of Output Information

Precision of output information is the variability of output information from that which it purports to measure. The response was favorable, but was the lowest of the questions answered positively. The ancillary group responded

statistically lower than the other groups on this question while the physicians recorded the highest score.

k. Question 11 - Communication with the Management Information Department (MID) Staff

Communication is the manner and methods of information exchange between the users and the MID staff. As noted previously, all questions concerning MID staff received high satisfaction levels from all the groups. None of the groups' responses were statistically different by t-test at alpha = 0.05.

l. Question 12 - Time Required for New Systems Developement

New systems development time is the time between user-initiated request for service or action and a reply to that request. Much like the processing of requests for changes to existing systems, the groups were either neutral or highly dissatisfied. The physicians were statistically less satisfied than the other groups; reporting the lowest index of any question.

m. Question 13 - Completeness of Output

All three groups were adequately satisfied with the comprehensiveness of the content of information product. The level of satisfaction of each group was similar with the administrative group the most satisfied.

3. Grouped Factors

The questions are grouped into three factors that comprise user satisfaction described by Ives, Olsen, and Baroudi (1983). These factors: MID staff and services, information product, and knowledge and involvement, are calculated through averages of the component questions. MID staff and services (Factor A) is sub-divided into two separate components: local MID staff functions (MID) and contractor functions (Contractor). Factor A (MID) is derived from questions 1, 6,and 11; Factor A (Contractor) from questions 2 and 12; information product (Factor B) from questions 7, 8, 9, 10 and 13; and knowledge and involvement (Factor C) from questions 2, 3, 4, and 5.

None of the work groups' satisfaction level to any of the factors were statistically different at significance level alpha = 0.05. However, general observations can be made. Figure 5.10 represents the work groups' level of satisfaction with relation to sub-total factors.

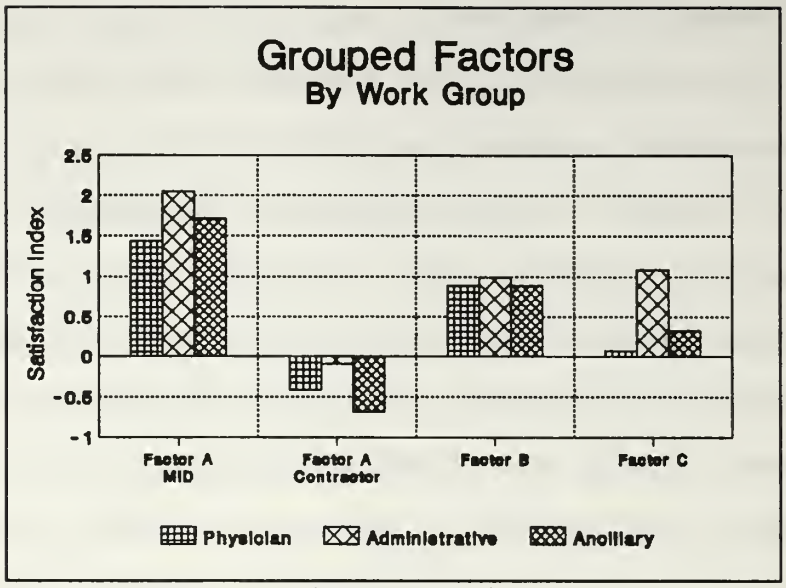

Figure 5.10

Figure 5.11 represents factor satisfaction of physicians compared to other respondents.

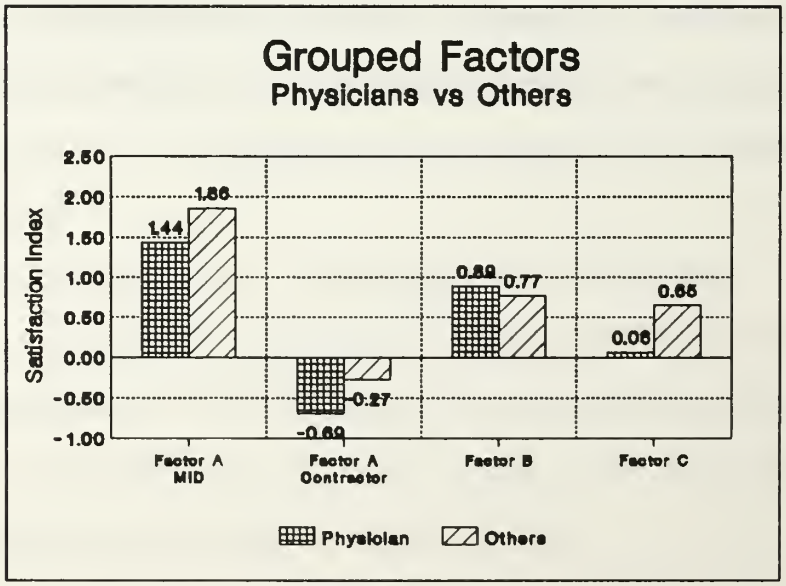

Figure 5.11

Figure 5.12 represents factor satisfaction of administrative personnel compared to other respondents.

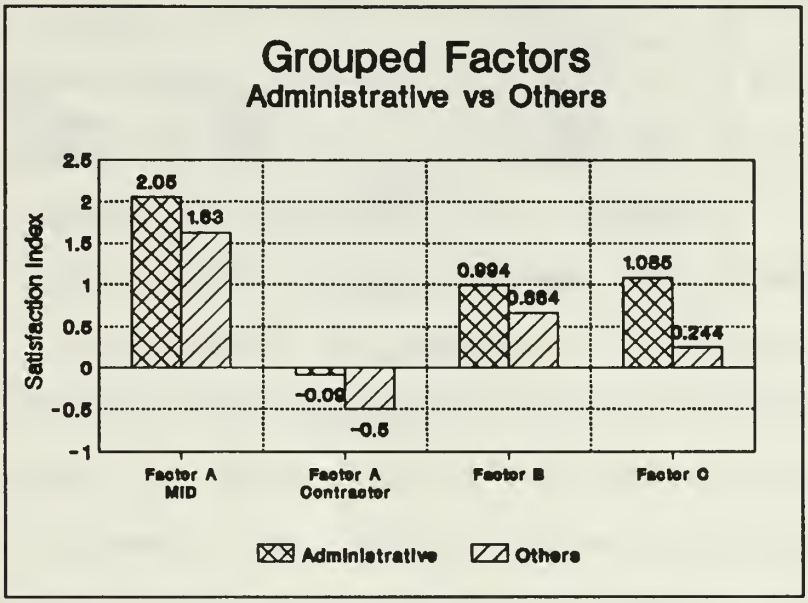

Figure 5.12

Figure 5.13 represents factor satisfaction of ancillary personnel compared to other respondents.

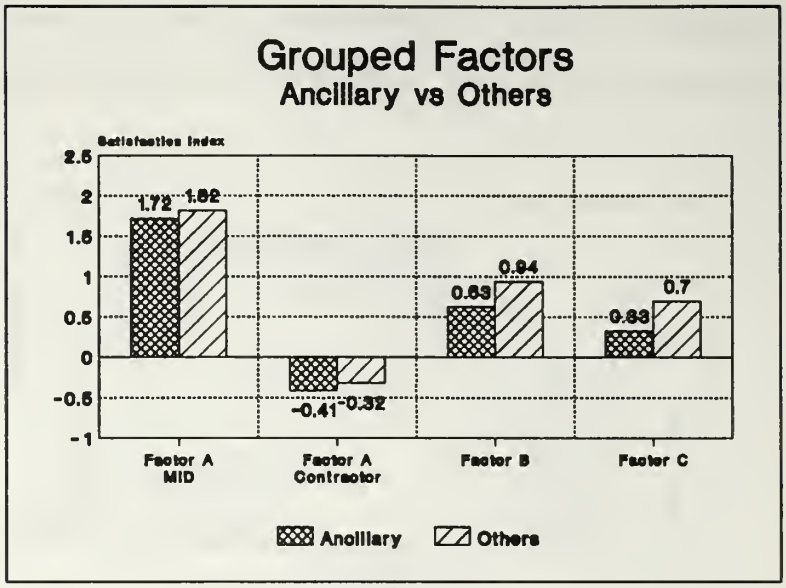

Figure 5.13

a. Factor A (Local MID Staff and Services)

This factor represents the attitude, services and relationship with the local MID personnel. As seen in Figure 5.10, the administrative personnel displayed the highest level of satisfaction. The lowest level of satisfaction, although still extremely positive, was displayed by the physicians.

b. Factor A (Contractor Services)

This factor represents the responsiveness and services of software programmers. This factor received the lowest level of satisfaction of any factor. All work groups rated this factor negatively, with ancillary personnel recording the lowest level of satisfaction of any group.

c. Factor B - Information Product

This factor represents the users perception of the quality of output from the system. Although the differences among the groups were not statistically significant, the administrative group scored the highest level of satisfaction. Ancillary members presented the lowest level of satisfaction.

d. Factor C - Knowledge and Involvement

This factor represents the respondents' self-reported assessment of the quality of training provided, their understanding of the system, and their participation in its development. There was a statistically significant difference between the level of satisfaction of the administrative group and the other respondents. Administrative personnel were highly satisfied with their knowledge and involvement of the system.

4. Time of System Use

As users become familiar with the functions of a system over time, it is expected that the more experienced users would exhibit a greater level of satisfaction.

Separating the respondents into subgroups of users with experience less than six months, six months to 11 months, and greater than 11 months provides subgroups of approximately equal size. The work groups exhibit roughly the same proportions. Figure 5.14 represents the breakdown of respondents time of system use.

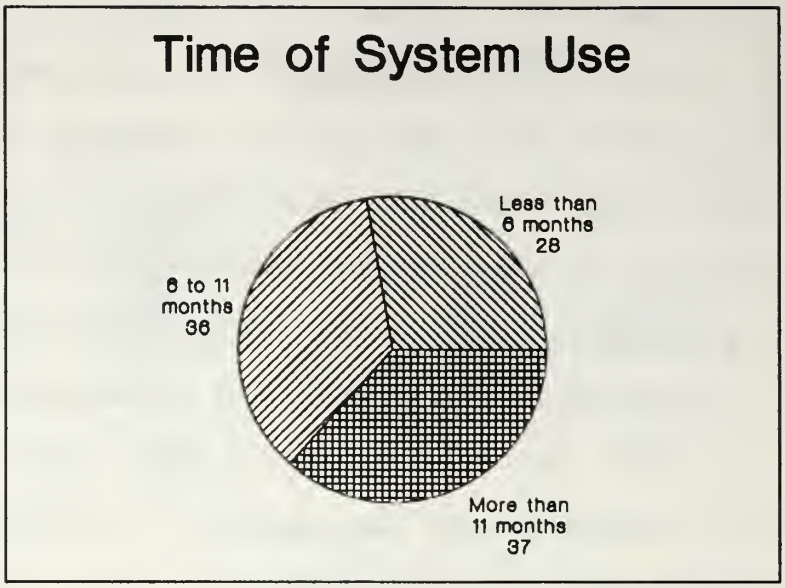

Figure 5.14

All the respondents, broken down by time of system use, demonstrate that user satisfaction did not appreciably change with the increase in experience of users. Figure 5.15 shows the level of satisfaction with CHCS verses time of system use.

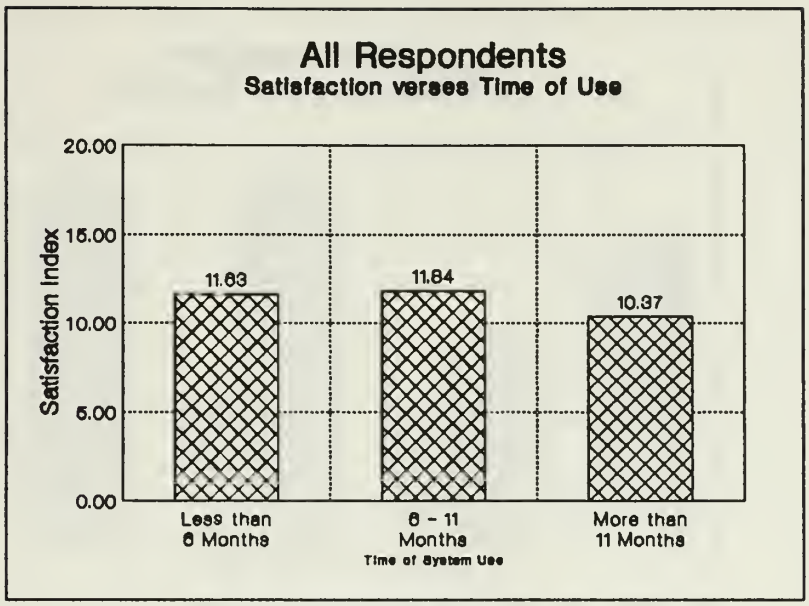

Figure 5.15

None of the work groups; administrative, physicians, or ancillary; exhibited any high correlation between time of system use and level of satisfaction of any factor by regression analysis. However, it is noteworthy to report the trends in the level of satisfaction for the work groups over time.

The administrative work group respondents with less than six months system use report a satisfaction index of 8.71. As the users gain experience with the system of six months, the level of satisfaction increases to 17.42. Satisfaction remains consistent, at 17.29, for users with greater than 11 months experience. Figure 5.16 shows the relationship of the satisfaction of administrative users to time of system use.

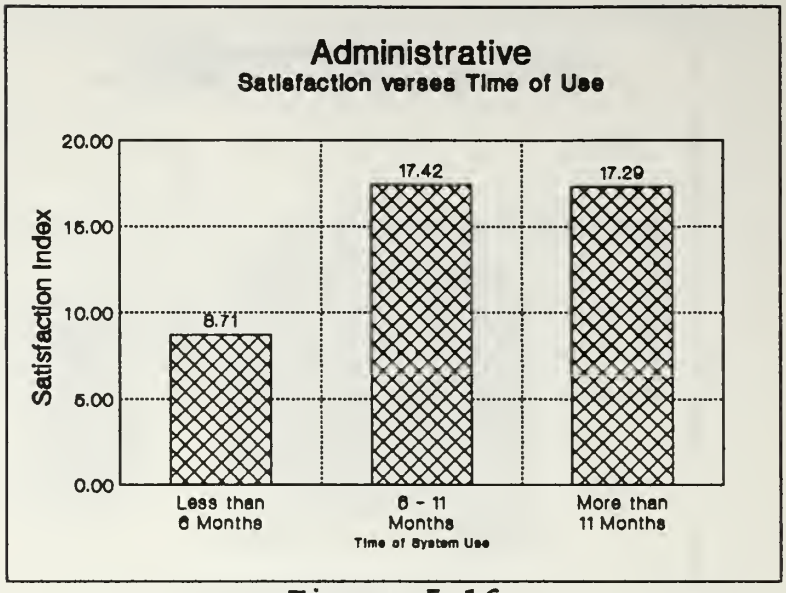

Figure 5.16

On the other hand, physicians' level of satisfaction is consistent (satisfaction index 6.50-6.37) for users up to 11 months of experience. The level of satisfaction increases for users with greater than 11 months of experience. Figure 5.17 shows physician satisfaction verses time of system use.

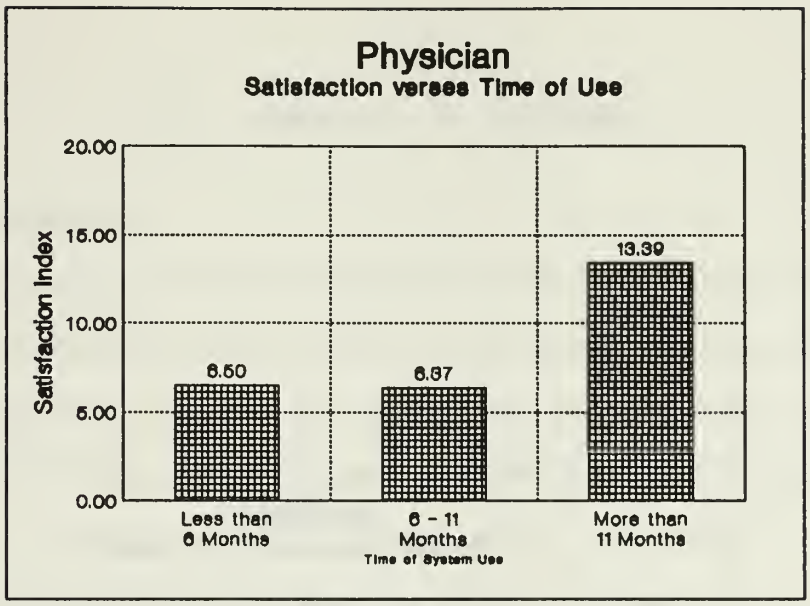

Figure 5.17

Unlike either the administrative or physician work groups, ancillary respondents with the least experience in system use demonstrated the greatest satisfaction (satisfaction index 16.90). The level of satisfaction declined to 11.44 for users with six to 11 months experience. Satisfaction further declined to 1.56 for users with greater than 11 months experience. Figure 5.18 shows the level of satisfaction verses time for ancillary users.

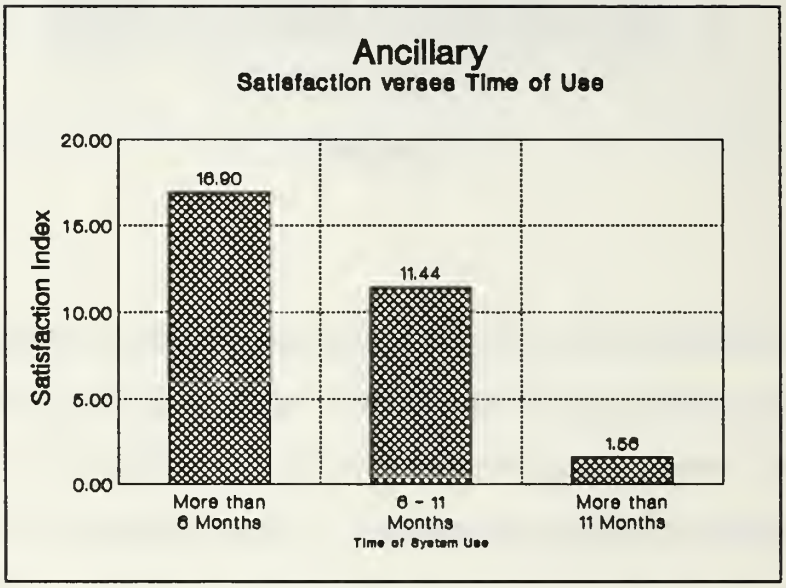
Ancillary
Satisfaction verses Time of Use
Satisfaction Index
20.00
15.00
10.00
5.00
0.00
16.90
11.44
1.56
More than
6 Months
6 - 11
Months
More than
11 Months
Time of System Use

Figure 5.18

VI. ANALYSIS OF FINDINGS

A. INTRODUCTION

The purpose of this research is to describe and document the user information satisfaction characteristics of the users of the Composite Health Care System at the Naval Hospital, Charleston. The study results are not to be seen as a definitive evaluation of CHCS, but provide a baseline reference point for identifying system strengths or possible areas of conflict and dissatisfaction. Areas identified as dissatisfying should be examined further through interviews and by examining the development and operating procedures of the work group to determine the possible causes and course of action.

The value of the satisfaction scores (positive or negative) is an important finding in itself, however, the relative comparison of scores across different groups of users is useful for the purposes of this study.

The analysis of the survey findings will primarily focus on the differences and similarities among the three work groups: administrative, ancillary, and physicians. The first section will look at the overall user information satisfaction with CHCS. The second section will discuss significant differences in individual question responses reported between

work groups. The third section will compare the three work groups with respect to the grouped factors: local MIS staff and services, contractor services, knowledge and involvement, and information product. The last section will look at user satisfaction for the three work groups from the perspective of time of system use.

B. OVERALL SATISFACTION

1. Combined Groups

The overall satisfaction index is a general description of the user's perception of CHCS as a whole. A negative result index would indicate dissatisfaction while positive results index some degree of satisfaction with the system. The survey average satisfaction index reported is 11.26. Since the overall satisfaction index ranges from -39 to 39 in scale, the respondents average overall satisfaction is characterized as slightly satisfied using the adjective qualifiers of Baroudi and Orlikowski (1988).

2. Comparison of Work Groups

The three work groups used in this study were chosen to differentiate the users by the way they primarily use the computer system. There were no significant differences found in overall satisfaction between any one work group and the remaining groups. Although all groups are considered slightly satisfied with CHCS, there are meaningful differences between the work groups' overall satisfaction.

Lowest of the work groups in overall satisfaction was the physician group (8.07). Physicians use CHCS almost exclusively for the conduct of direct patient care. The functionality of the system for physicians is the most diverse of the three groups. Requirements of computer input are different for medical record queries, prescribing medications, laboratory tests, radiology requests, and so on. The physician needs to know the procedures for each type of functionality to use the system effectively.

Each physician has a terminal located in the office. When using the system for out-patient purposes, the patient frequently is present in the office at the time of use. In addition, the medical profession have not traditionally used automated means to document patient treatments or write prescriptions in the past. The computer system can be considered, by them, an intrusion into their already busy schedule and has caused the physicians to alter their work patterns to accommodate the system.

The significant change of work habits, extensive functionality requirements, time constraints imposed on the physicians, and the presence of patients in the office while operating the system combine to make this finding not surprising.

Ancillary personnel, the largest of the work groups (46%), demonstrated a slightly higher overall satisfaction score (9.65). Most of the users in this work group are

technicians using the system to process prescriptions, laboratory specimens, or radiology requests. Ancillary areas in the hospital have had automated processing capabilities, in some form or another, for many years and are very accustomed to general computer use. Due to the large number of items processed each day in these areas, the users are under a tight time constraint to process items through the computer quickly.

The administrative group scored the highest overall satisfaction scores. Administrative personnel use the system for purposes other than for the direct conduct of patient care. With a few exceptions, the work performed on the system can be accomplished without the pressure of a limited and specific time constraint. The computer system can therefore be used at a comparatively slower pace than the other work groups. Once again with a few exceptions, most of the work performed by the administrative personnel previous to CHCS was performed manually. Automating the compilation and generation of reports can significantly reduce the time spent on these activities.

C. SIGNIFICANT INDIVIDUAL QUESTION DIFFERENCES

Although there are demonstrated differences in satisfaction among the various groups in every question, only the questions with significant differences among the work groups will be discussed in this section. The individual

questions will be combined into the grouped factors representing satisfaction in the next section.

1. Degree of Training Provided to Users

The results of the survey show the physicians were the least satisfied with the training provided, followed closely by the ancillary personnel. There is a significant increase in the satisfaction with user training expressed by the administrative personnel.

Effective user training is extremely important to the success of any computer system. The person's satisfaction with the initial user training received sets the stage for his or her satisfaction while operating the system. Often, user training is intensive only during the time a system is being implemented. After implementation new users are frequently required to learn the functionality of a computer system with On-the-job-training (OJT). Formalized training programs are difficult to conduct on a regular basis due to the constant change-over of personnel experienced at medical treatment facilities and the specialized requirements of the different work groups. Satisfaction with the degree of training provided is closely associated with the user's understanding of the system and their feeling of participation.

2. User's Understanding of the System

Users generally attain a high level of understanding of a computer system from either effective training or

experience or both. As anticipated, the work groups that reported a low level of satisfaction in user training (Physicians in particular) demonstrated a significantly lower level of satisfaction with their understanding of the system. The diverse functionality of the module used by physicians may also diminish their perception of the level of understanding.

3. User's Feeling of Participation

The user's perception of the shared involvement and commitment to the operation of the computer system is beneficial to the success of a computer system. Satisfaction with the level of participation naturally follows from the satisfaction of user training and the relationship with the MID staff. It is not surprising to observe the administrative work group scoring significantly higher than the other groups on this question.

D. GROUPED FACTORS

Baroudi and Orlikowski (1988) argue that the individual questions can be grouped into three factors, MIS staff and services, information product, and knowledge and involvement, that comprise user satisfaction. As discussed in Chapter V, the functions normally provided by a MIS of the companies studied in their research are provided by two separate entities at Naval Hospital, Charleston. Local support services are provided by the Command's Management Information Department, whereas software support is furnished by a

civilian software contractor. It is logical to divide the single factor, MIS staff and services found in the original study, to make two separate factors: local MID staff and services and Contractor's services.

The three work groups generally scored similarly in each of the four factors. The only exception being the statistically significant high level of satisfaction of the administrative group for the knowledge and involvement factor.

The most notable finding when four factors are examined is the significant negative level of satisfaction of all the work groups with the services provided by the software contractor. The services specifically asked in the questionnaire dealt with satisfaction of the time for system changes and new system development. The negative satisfaction finding for this factor is, however, expected. Bailey and Pearson (1983) list these two factors as the two most frequent for causing dissatisfaction among users; a finding supported by other published reports.

At the other end of the spectrum, the user's perception of the local MID staff and services is considered quite satisfactory. There does not appear to be any communication or attitudinal barriers to prevent an interchange of ideas between the respondents and the local MID staff.

Lower in satisfaction is the user's perception of the information product factor. The information product measures the quality of the information output provided to the user.

The three work groups combined rated this factor as slightly satisfactory. The users perceive the system positively in regards to the information's accuracy, variance, reliability, and relevancy to the intended function.

The physician and ancillary work groups displayed a positive satisfaction index for the knowledge and involvement factor. However, the satisfaction level demonstrated, albeit positive, was very close to neutrality. Administrative personnel indicated a satisfaction level significantly higher than the other two groups; high enough to be considered slightly satisfied with the factor. The combination of satisfaction with user training, system understanding, and participation is responsible for administrative work group's higher level of satisfaction..

E. SATISFACTION VERSES TIME OF SYSTEM USE

Satisfaction with a computer system is expected to improve the longer users operate a system over time; gaining more experience and understanding of the system.

An increase in overall satisfaction resulting from longer time of system use did not emerge from this study. The study did show, when considering the survey population as a whole, that user's satisfaction remained constant when compared to length of time the respondent had used the system.

As discussed in Chapter V, the Ancillary group making up 46% of the survey population tends to influence all

generalizations drawn from total survey population findings. Breaking down the findings by work groups demonstrates this fact well.

Positive trends in satisfaction for the administrative and physician work groups were displayed. Personnel in those work groups who have used the system the longest (greater than 11 months) were more satisfied with CHCS than those who had used the system less than six months.

The work performed by CHCS in the physician and administrative work groups was previously performed manually. As they worked with the system, their experience and confidence with CHCS expanded, thereby increased satisfaction was a result.

Administrative personnel, satisfied with the training provided, quickly grasped the system procedures. The structured application of CHCS to their work performed assisted in their acceptance of the system. Rapid increases in satisfaction with CHCS resulted.

The complex functionality of the physician modules is possibly responsible for their relatively prolonged time period before satisfaction is increased. After physicians learned the multitude of inputs necessary, their confidence and satisfaction with CHCS improved.

Ancillary personnel findings indicate a steady decrease in satisfaction with CHCS for those who have used the system the longest when compared to those persons having less than six

months exposure to system use. This is the opposite to what was anticipated. It is not clear why this finding occurred. An in-depth analysis of their policies and procedure along with interviews with the personnel is necessary to determine the cause of this finding.

VII. CONCLUSIONS AND RECOMMENDATIONS

A. MEASURING COMPUTER SYSTEM EFFECTIVENESS

In an environment of scarce financial resources, organizations need to measure the effectiveness of computer systems to justify expenditures. Of the several direct and in-direct methods available to measure computer system effectiveness, measurement of user information satisfaction is a suitable, available and effective surrogate measure. The previously developed and validated user information satisfaction questionnaire of Baroudi and Orlikowski (1988) is easily administered and provides sufficient responses to determine a baseline reference point for overall satisfaction as well as indicating potential problem areas. The survey is not a definitive evaluation of CHCS, but combined with further investigation, can be a powerful tool in the analysis and interpretation into the cause of user dissatisfaction.

B. SATISFACTION CHARACTERISTICS OF CHCS

Overall satisfaction is a generalization of all the characteristics that effect the satisfaction of the user. Along with overall satisfaction, the study specifically looked at the four factors that make up satisfaction: local MID staff and services, contractor services, knowledge and involvement, and information product.

1. Overall Satisfaction

The survey results indicate the users are slightly satisfied with CHCS at Naval Hospital, Charleston as a whole. The overall satisfaction scores do not differ significantly for the various types of personnel operating the system. In other words, the different ways (modules) in which people use the system did not affect their overall perception of the system.

2. Areas of Satisfaction

All three work groups rated the local MID staff and services as quite satisfactory. This is an indication that the local MID personnel is interacting well with the system users. The users perceive the local MID is taking care of their needs.

The output of the system, or information product, is considered by the users as slightly satisfactory overall. What they receive from the system in the form of output meets their expectations.

Although the overall satisfaction scores did not differ significantly, the administrative work group displayed higher satisfaction in many areas. The slightly higher satisfaction can be traced to their higher perception of satisfaction with the training provided. This leads to higher satisfaction in participation and understanding of the system. The manner in which the administrative group personnel are

trained or assisted is producing a more positive effect on their satisfaction than the other work groups.

3. Areas of Dissatisfaction

Factors that result in user dissatisfaction or significantly lower satisfaction when compared to other factors are potential areas for concern. Further investigation into areas of dissatisfaction can provide context, history and insight for possible corrective measures.

The respondents were most dissastified with the contractor services in respect to the time for new system developement and changes to the system. Although the exact cause of this dissatisfaction cannot be determined, most likely, the user's perception of the time required for these contractor activities is much less than the reality of the situation.

4. Satisfaction with Time of System Use

The expectation is that users will become more comfortable and confident, and therefore more satisfied, with CHCS as they gain increased experince using the system. This expectation was shown true for the physician and the administrative groups. However, the ancillary work group's satisfaction with the system was lower for experienced users than the less experienced users.

C. RECOMMENDATIONS

This study showed that the short-form questionnaire developed by Baroudi and Orlikowski (1988) is an effective means to measure user information satisfaction. The survey instrument is an appropriate instrument to document user satisfaction with the CHCS at other military medical facilities as well as documenting changes in user satisfaction at Naval Hospital, Charleston at a later time.

A survey of this type is best conducted by an individual at the site. It is beneficial for the researcher to have first hand experience as a user of CHCS. Additionally, direct contact with individuals for interview by the researcher is beneficial for adding context to history.

Additional investigation should be undertaken in several areas to add context and history. A larger and clearer picture may explain the reasons why the work groups had significant differences in their reported satisfaction to the various factors. These include:

1. The administrative group's overall higher satisfaction over the other work groups
2. The physicians' lowered perception of satisfaction in almost all areas
3. The reasons for the respondents having negative perceptions of satisfaction with contractor's services
4. The reduction of satisfaction for experienced ancillary users from less experienced ancillary users

The Baroudi and Orlikowski short-form questionnaire (1988) should be used to measure UIS at other CHCS sites for comparison to the results obtained from this study at Naval Hospital, Charleston. The survey should also be conducted at a later time at Naval Hospital, Charleston to monitor for any changes in UIS.

APPENDIX A
Part A: General Information

1. Hospital Department: (Check one)
   _____ General Administration
   _____ Nursing Administration
   _____ Dietary
   _____ Emergency
   _____ Laboratory
   _____ Medical Clinic
   _____ Inpatient Nursing
   _____ Pharmacy
   _____ Radiology
   _____ Other (Specify):_____

2. Job Description: (Check one)
   _____ Corpsman (0000)
   _____ Technician
   _____ Nurse
   _____ Pharmacist
   _____ Physician
   _____ Physician Assistant
   _____ Other (Specify):_____

3. Highest Level of Education: (Check one)
   _____ High School Graduate
   _____ Some College
   _____ Bachelor's Degree
   _____ Some Graduate Work
   _____ Master's Degree
   _____ Doctoral Degree
   _____ Medical Degree
   _____ Other (Specify):_____

4. Age: _____

5. Gender: _____ Male _____ Female

6. Length of time (in months) you have used CHCS: _____

7. Have you used other computer systems before ? _____ Yes ____

8. If your answer was Yes to question 7, was it a health care information system ? _____ Yes _____ No

Part B: The Questionnaire

This section of the survey conveys your own personal feelings concerning the use of the Composite Health Care system at Naval Hospital, Charleston. Please do not attempt to analyze the questions. Remember, there are no right or wrong answers.

Please follow these instructions:

1. Check each scale in the position that describes your evaluation of the factor being described.
2. Check each scale, do not omit any.
3. Check only one position for each scale.
4. Check in the space, not between spaces. THIS, NOT THIS
   :_X_:___X___:
5. Work rapidly. Rely on your first impressions.

ANSWERS BASED ON YOUR OWN FEELINGS

1. **Relationship with the Management Information Department (MID) staff**

dissonant :___:___:___:___:___:___:___: harmonious

bad :___:___:___:___:___:___:___: good

2. **Processing of requests for changes to existing systems**

fast :___:___:___:___:___:___:___: slow

untimely :___:___:___:___:___:___:___: timely

3. **Degree of training provided to users**

complete :___:___:___:___:___:___:___: incomplete

low :___:___:___:___:___:___:___: high

4. **User's understanding of systems**

insufficient :___:___:___:___:___:___:___: sufficient

complete :___:___:___:___:___:___:___: incomplete

5. **User's feeling of participation**

positive :___:___:___:___:___:___:___: negative

insufficient :___:___:___:___:___:___:___: sufficient

6. **Attitude of the Management Information Department staff**

cooperative :___:___:___:___:___:___:___: belligerent

negative :___:___:___:___:___:___:___: positive

7. **Reliability of output information**

high :___:___:___:___:___:___:___: low

superior :___:___:___:___:___:___:___: inferior

8. **Relevancy of output information (to intended function)**

useful :___:___:___:___:___:___:___: useless

relevant :___:___:___:___:___:___:___: irrelevant

9. **Accuracy of output information**

inaccurate :___:___:___:___:___:___:___: accurate

low :___:___:___:___:___:___:___: high

10. **Precision of output information**

low :___:___:___:___:___:___:___: high

definite :___:___:___:___:___:___:___: uncertain

11. **Communication with the Management Information Department staff**

dissonant :___:___:___:___:___:___:___: harmonious

destructive :___:___:___:___:___:___:___: productive

12. **Time required for new systems development**

unreasonable :___:___:___:___:___:___:___: reasonable

acceptable :___:___:___:___:___:___:___: unacceptable

13. **Completeness of the output information**

sufficient :___:___:___:___:___:___:___: insufficient

adequate :___:___:___:___:___:___:___: inadequate

Thanks again for your cooperation

APPENDIX B

Composite Health Care System
User Satisfaction Survey

This survey is part of a study of the Composite Health Care System (CHCS) effectiveness in military hospital inpatient, outpatient and administrative settings. The purpose of the study is to obtain information about your perceptions of how well CHCS functions in your area.

Just a few minutes are required to fill out the brief general information and the 13 question survey. Your responses will be treated in complete confidentiality. The data gathered through the survey will provide valuable insights into the system's strengths and weaknesses, and assist in future development, training and use.

The success of this survey depends on receiving as many completed surveys as possible from users in all hospital areas. Your participation makes an important contribution towards this end. There are no right of wrong answers, only your candid response to each question. Please do not omit any of the questions in either section of the survey.

Please return your completed survey to LT Powell in the Pharmacy Department in the addressed envelope provided. Thank you for your cooperation.

LT L.E. Hurd, MSC
Naval Postgraduate School
Monterey, Ca

APPENDIX C-1

COMBINED RESULTS FOR DOCTORS VS ADMINISTRATIVE VS ANCILLARY

TOTAL SATISFACTION	AVERAGE	INDEX
DOCTOR	0.620879	8.07
ADMIN	1.183258	14.96
ANCILLARY	0.742475	9.65

INDIVIDUAL QUESTION RESPONSES

QUESTION	1	2	3	4	5
DOCTOR	1.380952	-0.45238	0.047619	0.142857	0.52381
ADMIN	1.897059	-0.08824	1.426471	1.411765	1.588235
ANCILARY	1.652174	-0.82609	0.184783	1.032609	0.913043
STAND DEV.					
DOCTOR	1.28694	1.328898	1.342593	1.601393	1.611515
ADMIN	1.198752	1.967916	1.586474	1.498609	1.30601
ANCILARY	1.287597	1.700735	1.803107	1.712598	1.691827

QUESTION	6	7	8	9	10
DOCTOR	1.571429	1.071429	0.571429	1.404762	0.857143
ADMIN	2.308824	1.029412	1.220588	1.117647	0.808824
ANCILARY	1.934783	0.48913	0.902174	1.097826	0.206522
STAND DEV.					
DOCTOR	1.085219	0.921104	1.399353	1.083345	0.92582
ADMIN	0.965948	1.392631	1.401977	1.766432	1.650485
ANCILARY	1.014232	1.72566	1.437793	1.576334	1.56569

QUESTION	11	12	13
DOCTOR	1.357143	-0.92857	0.52381
ADMIN	1.941176	-0.07353	0.794118
ANCILARY	1.576087	0.01087	0.478261
STAND DEV.			
DOCTOR	1.185716	1.471566	0.833391
ADMIN	1.144518	1.764629	1.550723
ANCILARY	1.178877	1.775874	1.660652

APPENDIX C-2

PHYSICIANS vs THE REST OF THE SURVEY GROUP

GENERAL	AVERAGE	INDEX
DOCTOR SAT	0.620879	8.07
STDEV	1.445	8.37
NON-DOC SAT	0.930288	12.09
STDEV	1.703	12.44

GROUPED FACTORS	A (MID)	A (CONT)	B	C
DOCTOR GROUP	1.44	-0.27	0.885714	0.065476
NON-DOC GROUP	1.86	-0.69	0.761773	0.65
DOC STDEV	1.17	1.82	1.09207	1.505041
NON-DOC STDEV	1.16	1.41	1.604875	1.856174

QUESTION	1	2	3	4	5
DOCTOR SATIS	1.380952	-0.45238	0.047619	0.142857	0.52381
NON-DOC SATIS	1.75625	-0.5125	0.7125	1.19375	1.20625
DOC STDEV	1.28694	1.328898	1.342593	1.601393	1.611515
NON-DOC STDEV	1.252654	1.849656	1.81672	1.631054	1.578539

QUESTION	6	7	8	9	10
DOCTOR SATIS	1.571429	1.071429	0.571429	1.404762	0.857143
NON-DOC SATIS	2.09375	0.71875	1.0375	1.10625	0.4625
DOC STDEV	1.085219	0.921104	1.399353	1.083345	0.92582
NON-DOC STDEV	1.008123	1.61039	1.426997	1.654409	1.624837

QUESTION	11	12	13
DOCTOR SATIS	1.357143	-0.92857	0.52381
NON-DOC SATIS	1.73125	-0.025	0.6125
DOC STDEV	1.185716	1.471566	0.833391
NON-DOC STDEV	1.174798	1.766032	1.617466

APPENDIX C-3

PHYSICIANS vs THE REST OF THE STUDY GROUP

CALCULATED T-VALUE

QUESTION	T-VALUE	
1	-1.196	
2	0.169	
3	-1.869	
4	-2.666	*
5	-1.734	
6	-1.991	*
7	1.313	
8	-1.353	
9	0.998	
10	1.459	
11	-1.289	
12	-2.399	*
13	-0.241	

FACTOR	
A	-1.467
MID	
A	0.982
CONTRACTOR	
B	-0.334
C	1.331

OVERALL 1.397

* SIGNIFICANT AT ALPHA = 0.05

APPENDIX C-4

ANCILLARY vs THE REST OF THE SURVEY GROUP

GENERAL	AVERAGE	INDEX
ANCIL SATIS	0.742475	9.65
NON-ANCIL SATIS	0.967832	12.6
ANCIL STDEV	1.722284	11.7
NON-ANCIL STDEV	1.595243	11.8

GROUPED FACTORS	A (MID)	A (CONT)	B	C
ANCIL GROUP	1.72	-0.41	0.634783	0.328804
NON-ANCI GROUP	1.82	-0.32	0.935614	0.697727
ANCIL STDEV	1.17	1.78	1.621374	1.874259
NON-ANCI STDEV	1.18	1.73	1.395514	1.725329

QUESTION	1	2	3	4	5
ANCILLARY	1.652174	-0.82609	0.184783	1.032609	0.913043
NON-ANCILLARY	1.7	-0.22727	0.9	0.927273	1.181818
ANC ST DEV	1.287597	1.700735	1.803107	1.712598	1.691827
NON-ANC ST DEV	1.252887	1.753942	1.636454	1.65185	1.527616

QUESTION	6	7	8	9	10
ANCILLARY	1.934783	0.48913	0.902174	1.097826	0.206522
NON-ANCILLARY	2.027273	1.045455	0.972727	1.227273	0.827273
ANC ST DEV	1.014232	1.72566	1.437793	1.576334	1.56569
NON-ANC ST DEV	1.070532	1.229502	1.430077	1.542422	1.413299

QUESTION	11	12	13
ANCILLARY	1.576087	0.01087	0.478261
NON-ANCILLARY	1.718182	-0.40909	0.690909
ANC ST DEV	1.178877	1.775874	1.660652
NON-ANC ST DEV	1.189648	1.70426	1.325442

APPENDIX C-5

ANCILLARY vs THE REST OF THE STUDY GROUP

CALCULATED T-VALUE

QUESTION	T-VALUE	
1	-0.18	
2	-1.653	
3	-1.98	*
4	0.299	
5	-0.795	
6	-0.423	
7	-1.768	
8	-0.235	
9	-0.396	
10	-1.984	*
11	-0.572	
12	1.151	
13	-0.674	
FACTOR		
A	-0.406	
MID		
A	-0.245	
CONTRACTOR		
B	-0.948	
C	-0.976	
OVERALL	-1.197	

* SIGNIFICANT AT ALPHA = 0.05

APPENDIX C-6

ADMINISTRATION vs THE REST OF THE SURVEY GROUP

GENERAL	AVERAGE	INDEX
ADMIN SAT	1.182127	14.96
NON-ADMIN SAT	0.704363	12.94
ADMIN STDEV	1.6444	9.16
NON-ADMIN STDEV	1.645581	10.72

GROUPED FACTORS	A (MID)	A (CONT)	B	C
ADMIN GROUP	2.05	-0.09	0.994118	1.084559
NON-ADMIN GROUP	1.63	-0.8	0.664463	0.244403
ADMIN ST DEV	1.12	1.86	1.559052	1.742729
NON-ADMIN ST DEV	1.18	1.68	1.486632	1.770465

QUESTION	1	2	3	4	5
ADMIN	1.897059	-0.08824	1.426471	1.411765	1.588235
NON-ADMIN	1.567164	-0.70896	0.141791	0.753731	0.791045
ADMIN STDEV	1.198752	1.967916	1.586474	1.498609	1.30601
NON-ADMIN STDEV	1.265863	1.751332	1.746904	1.676404	1.605592

QUESTION	6	7	8	9	10
ADMIN	2.308824	1.029412	1.220588	1.117647	0.808824
NON-ADMIN	1.820896	0.671642	0.798507	1.19403	0.410448
ADMIN STDEV	0.965948	1.392631	1.401977	1.766432	1.650485
NON-ADMIN STDEV	1.04371	1.498369	1.430456	1.555407	1.512961

QUESTION	11	12	13
ADMIN	1.941176	-0.08824	0.794118
NON-ADMIN	1.507463	-0.28358	0.492537
ADMIN STDEV	1.144518	1.764629	1.550723
NON-ADMIN STDEV	1.183936	1.74471	1.487448

APPENDIX C-7

ADMINISTRATION vs THE REST OF THE STUDY GROUP

CALCULATED T-VALUE

QUESTION	T-VALUE
1	1.259
2	1.614
3	3.599 *
4	1.929
5	2.503 *
6	2.275 *
7	1.161
8	1.411
9	-0.221
10	1.213
11	1.759
12	0.53
13	0.949
FACTOR	
A	1.719
MID	
A	1.935
CONTRACTOR	
B	1.036
C	2.265 *
OVERALL	0.938

* SIGNIFICANT AT ALPHA = 0.05

APPENDIX C-8

SATISFACTION BASED ON TIME ON THE SYSTEM

OVERALL

# PEOPLE	TIME OF USE	AVG SAT
28	1 TO 5	11.64286
36	6 TO 11	11.84722
37	>= 12	10.37838
101		

ADMINISTRATION

# PEOPLE	TIME OF USE	AVG SAT
8	1 TO 5	8.8125
9	6 TO 11	17.4375
17	>= 12	17.36111
34		

ANCILLARY

# PEOPLE	TIME OF USE	AVG SAT
12	1 TO 5	16.91667
19	6 TO 11	11.5
15	>= 12	1.533333
46		

DOCTORS

# PEOPLE	TIME OF USE	AVG SAT
8	1 TO 5	6.5625
8	6 TO 11	6.375
5	>=12	13.2
21		

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